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ABSTRACT

This report of the Aerospace and Marine Science Program for students in the Washington, D.C. Public Schools is intended to provide direction to unmotivated students through an interdisciplinary curriculum based on marine and aerospace science themes. The program emphasizes career development and a competency based curriculum. An evaluation design chart is presented. It encompasses aspects ranging from school facilities, staff, and community resources to the student selection process, testing, and attendance. The major objectives of the project are given in this chart. Results of the evaluation of achievement are given from standardized tests, students' perceptions of academic progress and teachers' perceptions of academic progress. (Author/SA)

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RANDALL AEROSPACE AND MARINE SCIENCE PROJECT (RAMS)

An Evaluation Study

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

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FINAL REPORT

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CHAPTER 1

BACKGROUND AND PROJECT OBJECTIVES

The Aerospace and Marine Science Program at Randall (RAMS) was designed to provide the opportunity of an alternative educational program to senior high school students in the D.C. Public Schools. Through an interdisciplinary curriculum based upon aerospace and marine science themes, the program attempts to provide students with learning experiences that -- through the successful integration of theoretical (classroom) and practical and applied (field) activities -- provide a sense of direction to students who are not motivated to maximum academic achievement by regular school programs. Students are enrolled in one of the two programs -- aerospace or marine sciences.

The program further attempts to demonstrate the usefulness of classroom knowledge and skills in practical and vocational situations outside of the classroom. Career development and a Competency Based Curriculum are both important components of the program. RAMS relies heavily upon the resources provided in both the private and public sectors of the Washington, D.C. community.

In the third year of its operations, RAMS continued to expand and develop its curriculum so that RAMS themes would be incorporated into the entire range of academic subjects and so that the RAMS curriculum would meet the requirements of a Competency Based Curriculum set for D.C. Public Schools.

Special attention was given to the development and dissemination of the marine science curriculum, which did not receive as much attention as aerospace science during previous years. Furthermore, RAMS continued efforts, largely through staff training, to complete its recent transition from a junior to a senior high school. The Randall School context (in which the RAMS program is housed) has been a changing one that has necessitated the continued development of new program strategies to meet the needs of students. In the coming school year, the RAMS program anticipates increased enrollments and transition to a Career Education Center, which will require further refinement of project operations.

Specific objectives established for the program for the 1977-78 school year are as follows:

"MAJOR GOAL: TO DESIGN AND IMPLEMENT AN EDUCATIONAL PROGRAM WITH A 'MARINE' AND 'AIR' THEME BY INTEGRATING MARINE SCIENCE AND AEROSPACE EDUCATION IN AREAS OF THE CURRICULUM, BASED ON THE FACT THAT THE GENERALLY HIGH INTEREST OF YOUNGSTERS IN THESE AREAS WILL MOTIVATE THEM TO MAXIMUM ACHIEVEMENT IN PURSUIT OF THEIR STUDIES.

Major Performance Objectives:

1.) Participating RAMS teachers will develop positive attitudes toward the program's progress, their own progress in developing the program, and student gains in the program as measured by an attitude questionnaire.

2.) Project staff will develop curriculum units in at least five subject areas that have been determined by identified student needs.

3.) Fifty percent (50%) of the participating students in the RAMS program will raise their academic achievement as measured by pre and post standardized tests as compared with a control group.

4.) Seventy-five percent (75%) of the students participating in the RAMS program will achieve a 'C' or better in RAMS curriculum-based units; in addition, RAMS students will achieve a significant reduction in failing grades as compared to 1975-76 grades.

5.) Participating RAMS students will favorably improve their career awareness and their attitudes toward self, school, and the world of work as measured by pre and post attitudinal inventories and a comparison of nonparticipating students.

6.) Student retention in school will be increased as measured by comparison with Randall retention rates from earlier years and with citywide rates for comparable grade levels."

These objectives reflect emphasis on developing measurable objectives for teachers and students alike.

Among the aims of the project are the following:

1.) To provide an alternative form of education to high school students in Washington, D.C., in the provocative subjects of aerospace and marine science;

2.) To motivate students to maximum achievement in their studies through their interest in marine and aerospace science and technology;

3.) To provide opportunities for career exploration and development in aerospace and marine subjects.

To accomplish these aims, curriculum revision, staff development and dissemination activities have been undertaken for the past three years.

Evaluation Objectives

The following objectives were established for this year's evaluation:

1.) To review the goals and objectives of RAMS in order to determine their appropriateness to the project;

2.) To discover the impact of the RAMS project on student attitudes, career development, motivation for school, and achievement (school grades and test results);

3.) To assess student progress and retention in the program, including absences and tardiness;

4.) To study the impact of RAMS activities, courses, and field trips on student motivation and achievement;

5.) To ascertain the effectiveness of the materials, equipment, and resources provided by the project in achieving the program's objectives;

6.) To determine the staffing patterns, teacher roles, and teacher involvement in the RAMS program;

7.) To assess progress in curriculum development, dissemination and diffusion activities;

8.) To ascertain the extent of involvement and contributions of parents and community in the program;

9.) To identify areas of strength and areas requiring improvement in the program;

10.) To make appropriate recommendations to the D.C. Public Schools based on the findings of the study.

CHAPTER 2

EVALUATION DESIGN

An Input, Process and Product evaluation model was selected by the evaluators to ascertain the degree of effectiveness of those materials, methods and resources integral to project operations. This evaluation model was designed to encompass all important aspects of the project: the school facilities, curriculum units, community resources, instructional materials, the student selection process, the staff and in-service training, parental and community participation, the testing design used to measure student progress and performance, attendance records, and tradiness records.

Instruments were selected or devised to yield data related to each of the aims and objectives of RAMS, and this report is organized accordingly. The limitations in the design and instruments used were due to the late award of the evaluation contract (April 1978), e.g., it was not possible to obtain self-concepts on a pretest and a posttest. Nonetheless, adequate data and information was available for each of the aims and objectives. Recommendations for improved design and instrumentation are given where appropriate.

Chart 1 represents the design plan of the evaluation. This figure relates instruments and data sources to aims and objectives.

A brief description of each of the instruments and data sources is as follows:

1.) Structured Program Review Instrument. This instrument was used to elicit detailed information of program activities from the project coordinators, teachers, and school principal. Observations and findings presented later in this report are based in part on this instrument.

2.) Documents and Secondary Data. Documents reviewed included: curriculum materials, course descriptions, schedules, staffing memoranda, community resource correspondence, agendas and minutes of meetings, and other data.

3.) Principal's Interview. The Randall High School principal was interviewed for his perceptions and opinions of: RAMS goals within Randall, the progress of the program, staffing considerations, student recruitment, resources, facilities, and further needs of the program.

4.) Teacher's Interview. A semi-structured interview with those teachers involved with the RAMS program was conducted to gain insight into: the extent of teacher involvement in RAMS courses taught, teacher opinion of the thematic approach, the use and development of themes in their courses, the usefulness of field work as a teaching medium, preparation for high school teaching, RAMS courses, student

CHART 1
EVALUATION DESIGN PLAN

AIMS AND OBJECTIVES	INSTRUMENT OR DATA SOURCE								
	STAFF INTERVIEWS			Document Review	Standardized Tests	Course Grades	Attendance	Student Questionnaire	Parent Questionnaire
	Program Coordinators	Teachers	Principal						
Aim 1: To provide an alternative form of education to high school students in Washington, D.C., in the provocative subjects of aerospace and marine science.	X	X	X	X					X
Objective 1: Participating RAMS teachers will develop positive attitudes toward the program's progress, their own progress in developing the program, and student gains in the program as measured by an attitude questionnaire.	X	X	X	X				X	
Objective 2: Project staff will develop curriculum units in at least five subject areas that have been determined by identified student needs.	X	X		X					
Aim 2: To motivate students to maximum achievement in their studies through their interest in marine science and aerospace science and technology.		X			X	X		X	X
Objective 3: Fifty percent (50%) of the participating students in the RAMS program will raise their academic achievement as measured by pre and post standardized tests as compared with a control group.					X				
Objective 4: Seventy-five percent (75%) of the students participating in the RAMS program will achieve a "C" or better in RAMS curriculum-based units; in addition, RAMS students will achieve a significant reduction in failing grades as compared to 1975-76 grades.						X			

CHART 1 (Continued)
EVALUATION DESIGN PLAN

AIMS AND OBJECTIVES	INSTRUMENT OR DATA SOURCE								
	STAFF INTERVIEWS			Document Review	Standardized Tests	Course Grades	Attendance	Student Questionnaire	Parent Questionnaire
	Program Coordinators	Teachers	Principal						
Aim 3: To provide opportunities for career exploration and development in aerospace and marine subjects.	X	X						X	
Objective 5: Participating RAMS students will favorably improve their career awareness and their attitudes toward self, school, and the world of work as measured by pre and post attitudinal inventories and a comparison of nonparticipating students.	X	X						X	
Objective 6: Student retention in school will be increased as measured by comparison with Randall retention rates from earlier years and with citywide rates for comparable grade levels.	X	X					X	X	

progress, communications and coordination, teaching resources, and overall teacher opinion of the RAMS program.

5.) Standardized Tests. The Everyday Skills Test was used on a pretest-posttest basis, with a control group. This test yields scores for Reading and Mathematics. Only normative tests were used. It is worth noting that this was the first year of the RAMS program in which it was possible to carry out an adequate design using the pretest-posttest control group model. Sampling was limited to 10th graders, since this was the only grade for which pretests were available.

6.) Course Grades. Grade Point Averages are compared with results from earlier years.

7.) Attendance. Attendance rates are compared to those for prior years and to system-wide rates for senior high schools.

8.) Student's Questionnaire. This questionnaire tapped student attitudes toward school, the RAMS program, career development, and school retention.

9.) Parent's Questionnaire. This questionnaire tapped parent attitudes toward the program.

Chart 2 presents the target populations and sampling for the appropriate instruments.

Appropriate statistical methods are documented as used in the text. They primarily included frequencies and percentages. The "t" test was used with the Everyday Skills Test to test for the statistical significance of differences. The null hypothesis was rejected at the .05 level of confidence, but exact levels of confidence, greater than the .05 level, are reported in the text.

CHART 2

TARGET POPULATION AND SAMPLING PLAN

TARGET POPULATION	SAMPLING	COMMENTS
Program Coordinators -- 2	All	
Teachers -- 14	All	Limited to Randall teachers involved with RAMS -- 11 teachers interviewed.
300 RAMS students -- grades 9-12 Test -- Everyday Skills Test in Reading and Mathematics	90 - 10th grade RAMS students; 45 - 10th grade control students in another high school	Limited to 10th graders due to unavailability of pretests for grades 9, 11 and 12. Also limited to 73 students with both pretests and posttests.
Course Grades and Attendance	All 300	
Student Questionnaire	All	Returns obtained from 62 students.
Parent Questionnaire	All	Returns obtained from 31 parents.

CHAPTER 3

PROGRAM EFFECTIVENESS

The results obtained in the evaluation are discussed in this chapter in terms of the aims and objectives of the program.

A. ALTERNATIVE EDUCATIONAL PROGRAM

General

Among the aims of the RAMS program is the provision of an alternative educational program to students in Washington, D.C. who are interested in aerospace and marine science. The provision of alternative educational opportunities is considered important to the motivation of students to a renewed involvement in education.

Through a program that emphasizes aerospace and marine science "themes" within the regular school subjects, 9th through 12th grade students pursue a common thread in an interdisciplinary high school curriculum that ranges from science and mathematics to social studies, typing and industrial arts. The aerospace and marine science aspects of the entire curriculum are designed to give students a sense of purpose in all their studies. New and specialized courses in aerospace and marine science subjects were developed for use in the third year of program operations to further engage and challenge students in a meaningful learning process.

To accomplish its aims and objectives, the program has placed special emphasis upon the continuing development of the aerospace and marine science high school curriculum. Furthermore, the program attempts to apply practical and theoretical classroom experiences in the field, through the planned utilization of aerospace and marine science resources in Washington, D.C. and the surrounding area. Community resources used to conduct field activities include: NASA, the Federal Aviation Agency, Colgen Airways, Andrews Air Force Base, the Lightship Chesapeake, the National Arboretum, NOOA, the Harbor Police, and many others. By actively extending student experiences outside of the classroom, the program attempts to further enhance student motivation for learning.

Drawing Power

The drawing power of such an alternative gives evidence of the educational viability of programs such as RAMS. Since 1975-76, the first year of the RAMS program, enrollment has grown from 70 students to approximately 150 in 1976-77 and almost 300 in 1977-78, an increase of more than 400%. During the current year, the program drew more students from throughout the entire city than from the Randall School area in Southwest.

Actual RAMS enrollments most likely do not represent the full extent of student interest in the program, since limitations in the Randall facility -- both in its high school program and resources -- have tended to discourage the enrollment of those students who might otherwise have been interested. The program coordinators and Randall principal reported that as many as 500 students seriously considered enrollment at the outset of the school year, although only 300 actually enrolled. Again, it would appear that interest in the program is substantially larger than actual enrollments would indicate.

Student Recruitment

The recruitment of students was expedited through presentations at assemblies in 23 junior and senior high schools; announcements and contacts with school principals and counselors; and news media (television and radio) reviews and announcements.

In order to meet the enrollment goal of approximately 500 students for the coming school year (1978-79), active recruitment efforts have been continued.

Randall School Context

Since 1975, Randall has been in the process of changing from a junior high school to a senior high school. As noted in earlier reports, this transition has continued to encumber RAMS with problems stemming from a changing environment. Currently, the Randall principal and program coordinators report that the school is to be closed as a senior high school.

The Aerospace and Marine Science program will be transferred to the Division of Career and Vocational Education, and will operate as a Career Center. It will occupy the Randall facility for one more year and may thereafter be transferred to another location. This change in plans has raised many uncertainties among the staff and prospective students. In the opinion of the evaluator, it has limited the benefits that might otherwise have accrued in the project.

Staff and Community Opinions

The opinions of both the staff of Randall and parents of participating students support the notion that the RAMS program is a viable educational alternative.

Parent opinions were obtained from a mail questionnaire. Of the 31 parents who responded in time for this report, 83.8% reported that both they and their child had a favorable opinion of the program; 80.8% felt that their child's attitude toward school had improved and that they would like to see the program continued.

Additionally, the RAMS program continues to receive outstanding support from certain Federal government agencies, District government agencies, and many private organizations and individuals.

Curriculum Development

Substantial progress has been made in the development of the Marine Science Curriculum, an area that was deficient last year. Through the efforts of the Marine Science Coordinator, a large variety of source materials have been compiled. Sources were obtained through mail and personal requests. Examination of those letters replying to the Marine Science Coordinator's request show a great deal of interest in this project, especially since there is currently very little literature available concerning marine science at the high school level.

In addition, teachers continued to develop and use themes in their courses.

Overall, a great deal has been accomplished in the area of curriculum. The project has continued to benefit from the input of various consultants, educators and government agencies. Field sites and resources used in prior years continue to be available to the project for use as needed.

Among the resource organizations participating in the three years of RAMS operations are the following: Lightship Chesapeake, The National Oceanic and Atmospheric Administration, Colgen Airways, The National Aquarium, The Federal Aviation Agency, The U.S. Department of Transportation, The National Capital Parks of the Department of the Interior, The Metropolitan Police Department -- Harbor Section and Helicopter Squad, The Civil Air Patrol -- National Capital Wing, The D.C. Mayor's Office, The Tuskegee Airman's Association, The Leesburg Air Traffic Control Facility, Dulles and National Airports, The U.S. Department of the Navy and the Naval Tutorial Program, The Kiwanis Club, The David Taylor Center, Chincoteague Island, The Patuxent Naval Air Station, Fort McHenry Shipyard, The Adult Marine Workshop, The Congressional Flying Club, The Smithsonian National Air and Space Museum, The U.S. Coast Guard Auxiliary, The Waterfront Washington Association, The D.C. Recreation Department, The Marine Technology Society, The Air Kue Pilots Association, The D.C. Air National Guard, and The American Oceanic Organization.

Budget, Equipment, Materials, Supplies and Resources

No major problems were reported in any of these areas. This is a major improvement in program operations and support over previous years. Notably, some special items of equipment were in evidence. The school system is to be commended for improvements in these needed areas of support.

From this information, it can be concluded that RAMS is meeting its aim of providing an alternative educational opportunity for high school students in Washington, D.C.

B. TEACHER ATTITUDES AND SUPPORT

Less than optimal preparation and support for the instruction of RAMS subjects, as noted in earlier evaluation reports, led to efforts to improve upon the involvement and attitudes of teachers assigned to the program. This resulted in Objective 1, as follows:

> "Participating RAMS teachers will develop positive attitudes toward the program's progress, their own progress in developing the program, and student gains in the program as measured by an attitude questionnaire."

A questionnaire devised by the program coordinators revealed that only about half of the teachers surveyed reported positive attitudes toward the program's progress, toward their own progress in the program, and toward student gains in the program.

The interviews conducted by the evaluator suggest that these figures are substantially correct -- about one-half of the teachers involved view the program positively and one-half view it negatively or with major reservations.

The interviews also suggest that the lack of background in RAMS topics and the failure to better prepare themselves for high school level teaching underlies these negative teacher feelings.

The teaching staff has remained essentially the same as in the previous year. Unfortunately, only two of twelve teachers made efforts to upgrade their qualifications to teach at the high school level or to prepare themselves better to teach aerospace or marine science themes. This lack of preparation was further limited by the ability of the program coordinators to obtain scheduled staff development time for only one staff development session. This amount of preparation is far too limited to allow for teachers to become effective purveyors of the program. Furthermore, the RAMS summer staff development application was not supported.

The limited results with teachers were achieved in spite of the fact that many efforts were made to involve teachers. Actual demonstrations of the ease with which air/marine themes can be incorporated into the instruction of various subjects were conducted for teachers in staff development workshops. Teachers were also invited to attend several feature nights (i.e., at the National Air and Space Museum) at which experts and leading authorities from various agencies and businesses presided in activities highlighting the RAMS program. Other activities were scheduled to actively engage teachers in RAMS. Teachers were invited to write specific curriculum units for publication and national dissemination, and to recount their personal experiences while teaching in the RAMS program. This was only partly accomplished. In order to provide the program with an orientation to the vocational needs of students, teachers were constantly briefed on job opportunities for students, especially in terms of the academic preparation required

for those jobs. Interest in the RAMS program extends far beyond the local community, and representatives from the boards of education as far away as New York and Chicago visited participating teachers.

In summary, the results show that Objective 1, which relates to teachers' attitudes, was only partially achieved and requires further attention.

It is reported that, with the upcoming transfer of RAMS to Career Education, new teaching staff will be recruited for next year through citywide advertising, in order to better meet the project's needs as a Career Education Center. A proposed listing of courses, for which qualified teachers will be recruited, has been submitted.

Evidence of support by teachers was also sought in terms of teacher involvement in curriculum development and in the actual instruction of RAMS themes in the classroom. Objective 2 is related to curriculum development:

> "Project staff will develop curriculum units in at least five subject areas that have been determined by identified student needs."

Documentary evidence presented suggests that this objective was accomplished, in part. The program coordinators note that although 5 areas were developed, they were not complete according to the Competency Based Curriculum criteria used to judge their quality.

In the interviews, all teachers were able to give examples of RAMS themes used in their classes. With the exception of the science teacher, all were quick to point out that many units did not lend themselves to the introduction of RAMS themes.

To gain another perspective on the project staff development of curriculum units, students were asked their perceptions of the emphasis placed on RAMS themes in their courses. The results show that 70% of participating students felt that not enough emphasis was placed on RAMS topics in mathematics; 61.4% in English; 25.7% in history or social studies; and 24.3% in science.

Much more needs to be done in actively supporting the RAMS thematic concept. Clearly, the restaffing of RAMS seems in order. The accomplishments of six to eight teachers who have successfully worked with the program can provide a good basis for the development of an effective RAMS curriculum.

C. STUDENT ACHIEVEMENT

Improvement in the academic achievement of the participating students is an important aspect of RAMS. As stated in the project proposal, students are expected to improve their academic achievement as a result of enhanced motivation and interest in school. Evidence of improved achievement comes from several sources.

Standardized Test Results

Objective 3 states:

> "Fifty percent (50%) of the participating students in the RAMS program will raise their academic achievement as measured by pre and post standardized tests as compared with a control group."

The Everyday Skills Test (EST) was administered to 10th grade students in the RAMS program and to a control group in another high school. The results are for those students who completed both a pretest and a posttest. The control group was obtained through the cooperation of a high school in another part of the city. Since the pretests had been administered in November by the D.C. Public Schools, it was only necessary to administer the posttests to the RAMS and control students. The posttests were administered in June 1978. The control was an available group of students all from the same section. A matched groups design was used to equate the RAMS and controls on the pretest.

The Everyday Skills Test yields scores in both Reading and Mathematics. It is considered suitable for an inner city population and was administered in Fall 1977 to all 10th grade students as part of the D.C. Public Schools' regular testing program.

The results for the EST Reading Test are shown in Table 1. These results show that RAMS students made much higher average gains in reading than did the control group. The 26 marine science students attained an average score of 24.4 on the pretest and 36.2 on the posttest, for a gain of 11.8; the 47 aerospace students attained an average score of 27.9 on the pretest and 31.0 on the posttest, for a gain of 3.1; however, the control group students had an average score of 23.6 on the pretest and dropped to 19.6 on the posttest for a loss of 4.0.

The differences in mean (average) gains were highly statistically significant. The "t" tests of statistical significance on the gain scores were as follows:

The differences in mean gains between the marine science and the control group were statistically significant beyond the .001 level of confidence, "t" = 7.01 and df = 42.

Table 1

COMPARATIVE ANALYSIS OF THE EVERYDAY SKILLS TEST IN READING[1]

	RAMS						CONTROL GROUP		
	Aerospace			Marine Science					
	Pretest	Posttest	Gain	Pretest	Posttest	Gain	Pretest	Posttest	Gain
Mean	27.9	31.0	3.1	24.4	36.2	11.8	23.6	19.6	-4.0
Standard Deviation	8.94	9.79	9.35	8.52	6.09	8.97	9.26	6.63	6.02
N	47	47	47	26	26	26	18	18	18

[1] Reading Total Score was used.

Note: All students are 10th graders. Pretests were administered in November 1977; posttests in June 1978. Raw scores are shown in the table.

The differences in mean gains between the aerospace science and control group were statistically significant beyond the .001 level of confidence, "t" = 5.12 and df = 63.

Similarly, post test differences favored RAMS students over the control group. A comparison of the marine science group with the control group yielded "t" = 8.34, df = 42, significant beyond the .001 level of confidence; aerospace vs. control group yielded "t" = 5.39, df = 63, significant beyond the .001 level of confidence.

Although average pretest scores were slightly higher for the aerospace group (27.9) than for the marine science (24.4) or control group (23.6), these differences were not statistically significant at the .05 level of confidence, using the "t" test (marine science vs. control: t = 0.28, df = 42; aerospace science vs. control: t = 1.69, df = 63). These results support the conclusion that the groups did not differ on the pretest.

Statistical significance is, however, not the same as educational significance. The educational significance of the RAMS gains in achievement is best understood in terms of norm group results, as shown in Table 2.

These results indicate that the RAMS students made important gains in Reading -- 0.9 Grade Equivalents for aerospace and 3.3 Grade Equivalents for marine science, while the control group declined by 0.9 Grade Equivalents. However, it should be noted that aerospace students continued to score more than two grades below the 10th grade norms.

Findings for the Mathematics section of the EST showed results similar to those for Reading. Test results favored the RAMS students over the control group.

The results for the EST Mathematics Tests are shown in Table 3. These results show that RAMS students made higher average gains in mathematics than did the control group. The 26 marine science students attained an average score of 18.2 on the pretest and 35.2 on the posttest, for a gain of 17.0; the 48 aerospace students attained an average score of 22.5 on the pretest and 29.9 on the posttest, for a gain of 7.4; however, the control group students had an average score of 25.2 on the pretest and 26.9 on the posttest, for a gain of only 1.7.

The differences in mean gains were again statistically significant, with "t" tests as follows: marine science vs. control group: "t" = 13.33, df = 41, statistically significant beyond the .001 level of confidence; aerospace science vs. control group: "t" = 2.40, df = 63, statistically significant beyond the .05 level of confidence.

The differences in the means for the posttests were statistically significant for the marine science vs. control group ("t" = 2.84, significant beyond the .01 level of confidence), but were not statistically significant at the .05 level of confidence for the aerospace vs. control group (t = 1.10).

Although the RAMS students scored somewhat lower (aerospace, 22.5; marine science, 18.2) than the control students (25.2) on the Mathematics pretest, the differences were not statistically significant at the .05 level of confidence, using the "t" test (aerospace vs. control -- "t" = 0.88, df = 63; marine science vs. control -- "t" = 1.84, df = 42). These results support the conclusion that the groups did not differ on the pretest.

Table 2

COMPARATIVE RESULTS OF THE EVERYDAY SKILLS

READING TEST IN GRADE EQUIVALENTS

Group	Pretest	Posttest	Gain
RAMS			
Aerospace	6.9	7.8	0.9
Marine Science	6.0	9.3	3.3
CONTROL GROUP	6.0	5.1	-0.9

Note: Grade Equivalents are based on mean (average) raw scores in Table 1.

The results for Mathematics in Grade Equivalents are shown in Table 4. (See page 20.) Although the control group started out with a higher pretest Grade Equivalent score (6.1) than either aerospace (5.8) or marine science (5.0), the RAMS groups achieved larger gains (aerospace, 1.4; marine science, 3.1) that brought them ahead of the control group on the posttest -- aerospace 7.2; marine science, 8.1; and controls, 6.5. As in reading, RAMS students continued to score two or three grades below norms for 10th graders.

Grades

The second aspect of academic achievement concerns student grades in school.

Objective 4 of the RAMS program states,

"Seventy-five percent (75%) of the students participating in the RAMS program will achieve a 'C' or better in RAMS curriculum-based units; in addition, RAMS students will achieve a significant reduction in failing grades as compared to 1975-76 grades."

Table 3

COMPARATIVE ANALYSIS OF THE EVERYDAY SKILLS TEST IN MATHEMATICS

	RAMS						CONTROL GROUP		
	Aerospace			Marine Science					
	Pretest	Posttest	Gain	Pretest	Posttest	Gain	Pretest	Posttest	Gain
Mean	22.5	29.9	7.4	18.2	35.2	17.0	25.2	26.9	1.7
Standard Deviation	15.89	11.17	14.67	15.73	9.73	3.98	8.57	9.17	4.56
N	48	48	48	26	26	26	17	17	17

Note: All students are 10th graders. Pretests were administered in November 1977; posttests in June 1978. Raw scores are shown in the table.

Table 4

COMPARATIVE RESULTS OF THE EVERYDAY SKILLS

MATHEMATICS TEST IN GRADE EQUIVALENTS

Group	Pretest	Posttest	Gain
RAMS			
Aerospace	5.8	7.2	1.4
Marine Science	5.0	8.1	3.1
CONTROL GROUP	6.1	6.5	0.4

Note: Grade Equivalents are based on mean (average) raw scores in Table 3.

Grade Point Averages (GPA) for RAMS students were provided to test this objective. Individual course grades were not available in time for this report to test whether or not, "...75% of RAMS students achieved a 'C' or better in RAMS units."

GPA's shown in Table 5 provide the data necessary to establish whether failing grades were significantly reduced.

The results indicate a very substantial reduction in GPA's of 0.0 to 0.9 (these are equivalent to failing grades) -- from 39.1% in 1975-76 and 31.3% in 1976-77 to 9.2% in 1977-78.

This data supports the finding that Objective 4 was accomplished. It should also be noted that GPA's of 2.0 -- 2.9 increased during this period from 24.6% in 1975-76 and 20.4% in 1976-77 to 33.6% in 1977-78. However, GPA's of 3.0 or higher decreased from 8.7% in 1975-76 to 6.1% in 1976-77 to 7.2% in 1977-78.

The GPA was computed on the basis of grades in academic subjects -- English, science, mathematics, history, social studies, geography, and civics. Non-academic subjects (business, music, health, industrial arts, electives) were not included. Computation was based on a four point scale, namely, A = 4, B = 3, C = 2, D = 1, F = 0. The formula was:

$GPA = \frac{X}{n}$ where X is the grade value and "n" is the number of grades included in the average.

Table 5

GRADE POINT AVERAGES (GPA) OF RAMS STUDENTS OVER A THREE YEAR PERIOD

Grade Point Averages	1975-76		1976-77		1977-78	
	Number	%	Number	%	Number	%
3.0 or higher	6	8.7	9	6.1	21	7.2
2.0 -- 2.9	17	24.6	30	20.4	98	33.6
1.0 -- 1.9	19	27.6	62	42.2	146	50.0
0.0 -- 0.9	27	39.1	46	31.3	27	9.2
Total	63	100.0	147	100.0	292	100.0

Student Perceptions of Academic Progress

Further evidence regarding academic achievement comes from the students' responses to the Student Questionnaire, as follows:

	% Agree
(Question 16) I believe that I am improving my grades as a result of being in the RAMS project.	65.7%
(Question 21) I am getting the grades I deserve in my RAMS courses.	44.3%

Almost two-thirds of the students feel that their grades are improving as a result of being in RAMS. This is evidence supportive of the impact of RAMS on academic achievement.

Comments from the program coordinators suggest that many students felt that they are not being graded fairly by some teachers. Many students felt that they were downgraded in some courses. This may account for the feeling of many students that they are not getting the grades they deserve. This is a matter that merits consideration by the school staff.

Teacher Perceptions of Academic Progress

In the interviews, nine of eleven teachers indicated that the academic performance of students was improved when compared with last year. However, this improvement is attributed to the ability of RAMS to attract more capable students from throughout the city. The teachers felt that students from the Randall area did not show any noticeable improvement in achievement.

D. CAREER DEVELOPMENT

An important facet of the RAMS program is its emphasis upon career development through the exposure of students to a wide range of actual working situations, hands-on experiences, special programs and occupational and educational information. For the inner city student, exposure to the vast range of career opportunities in the aerospace and marine science fields serves to broaden the horizons of the student, making him aware of the opportunities available to him, and developing knowledge of educational and other requirements for careers in these fields.

Part of Objective 5 is relevant in this respect:

> "Participating RAMS students will favorably improve their career awareness and their attitudes toward self, school, and the world of work as measured by pre and post attitudinal inventories and a comparison of nonparticipating students."

Evidence for the evaluation of this objective was obtained largely from the Student Questionnaire and staff observations. A pretest-posttest analysis was not carried out, since an instrument for this purpose was not administered by the project staff and the evaluation contract was started too late in the school year (April) to do so.

Students were asked, "To what extent have you learned about career opportunities in the RAMS project?" Table 6 compares the student response for this item for the school years 1976-77 and 1977-78. This comparison is possible, since the question, as stated, appeared on the Student Questionnaire for both years.

Table 6

LEARNING ABOUT CAREER OPPORTUNITIES

"To what extent have you learned about career opportunities in the RAMS project?

	1976-77 Percent	1977-78 Percent
A lot	25.3	58.6
Some	47.1	35.7
Not Much	27.6	5.7
Total	100.0	100.0

The results show an improvement over last year, with 94.3% of this year's students responding that they learned about career opportunities at least to some extent, compared with 72.4% of last year's students.

On the questionnaire, students were asked to identify the three most important things they learned about careers (question 32). Six students learned about the range of careers in the field of aerospace; five students cited the availability of jobs for those with vocational training in aviation ("I can easily get a job."); and 4 students responded that they could learn to fly. On the other hand, two students cited a specific vocational skill -- designing planes. Other responses included: "the importance of flights" (2), "it pays good money" (2), "the importance of hard work" (1) and meteorology (1).

In interviews, staff members agree that students are gaining valuable exposure to careers and job opportunities in the marine science and aerospace fields. It is reported that students talk about these fields among themselves and with the staff; they display an interest in RAMS related themes within the classroom; they observe on their field trips that blacks are employed in these fields and that many blacks have had distinguished careers in marine science and aerospace. This opportunity for personal identification with persons in the field is quite important to RAMS students.

Students met a RAMS graduate currently working as an air traffic controller, and time and again the project emphasized that equal opportunity for employment does exist for those who have properly prepared themselves for their field. The project attempted to demonstrate to students, at every opportunity, that they too could pursue successful careers in aerospace and marine science.

Generally, the evidence would seem more than adequately to support that part of Objective 5 concerned with career development. And certainly the range of exposure afforded students by field trips lends further support to the program's efforts.

Nevertheless, with the imminent conversion of RAMS to a career center, a sharper focus is needed in terms of program strategies and evaluation strategies for career development purposes. The program strategies should better define the teaching and learning processes vis-a-vis career development and develop a sound plan for their implementation. Various career development models should be examined for this purpose.

Career development objectives should not be co-mingled with other objectives. They should be stated in measurable terms with major and sub-objectives. Instruments selected should be given on a pretest-posttest basis with provision for a control group. Observational and documentary evidence should be used to amplify the comparative analysis.

E. STUDENT PERCEPTIONS OF THE RAMS PROGRAM

Student perceptions of the program provide information relevant to that part of Objective 5 relating to attitudes toward school.

Objective 5 states,

> "Participating RAMS students will favorably improve their career awareness and their attitudes toward self, school, and the world of work as measured by pre and post attitudinal inventories and a comparison of nonparticipating students."

Tables 7 through 10 show the results of the Student Questionnaire. Questionnaires were received from 70 of approximately 300 RAMS students or 21% of the entire RAMS student population. Since this is a low return rate, the results should be interpreted cautiously. Forty percent (40%) of questionnaires were received from aerospace students and 60% from marine science students. Over 58.6% of the students returning questionnaires were enrolled in the program for the first year; 28.6% for the second year; and 12.9% for the third year. Approximately 83% did not come to Randall from another junior or senior high school. A majority of questionnaires were completed by students in the 10th grade (68.6%), with 25.7% in 11th grade, and only 2.9% in grades 9 and 12.

Students were asked to rate RAMS courses in relationship to "regular" courses, as much more interesting, more interesting, about the same, less interesting, and much less interesting. Results for this item are shown in Table 7.

Students indicated most improvement in their history or social studies courses, with 54 (77.2%) students rating their courses as more interesting or much more interesting than regular courses. Only 2 (2.8%) students found history or social studies less interesting or much less interesting. Fifty (70.7%) students rated their science courses as more interesting or much more interesting than the regular courses. Only 5 (7.1%) students found their science course less interesting or much less interesting. While students were somewhat less enthusiastic in their ratings for English and mathematics, approximately three-fourths of those responding indicated that the courses were, at least, as interesting as their regular courses.

On the average, over half the students (54.1%) rated all their RAMS courses as more interesting or much more interesting than their regular courses. Only an average of 13.1% of the students found their courses less interesting or much less interesting, and an average of approximately four-fifths of those students responding indicated that their courses were, at least, as interesting as their regular courses.

Table 7

RAMS STUDENTS' INTEREST IN COURSES

How do you feel about the courses you are taking in the RAMS program? Mark your answers as follows:

MMI -- Much more interesting than regular courses.

MI -- More interesting than regular courses.

S -- About the same as regular courses.

LI -- Less interesting than regular courses.

MLI -- Much less interesting than regular courses.

Item Number and Description		MMI	MI	S	LI	MLI
1. Science	f	18	32	12	4	1
	%	25.7	45.0	17.1	5.7	1.4
2. Mathematics	f	3	15	34	11	5
	%	4.3	21.4	48.6	15.7	7.1
3. English	f	8	22	25	10	4
	%	11.4	31.4	35.7	14.3	5.7
4. History or social studies	f	31	23	11	1	1
	%	44.3	32.9	15.7	1.4	1.4
Average Percentages		21.4	32.7	29.3	9.3	3.9

N = 70; Differences indicate blanks.

Students were asked how they felt their courses related to the RAMS program, as to whether there was not enough, enough, or too much emphasis on RAMS topics. Results for this item are shown in Table 8.

Only a small number of students felt that there was too much emphasis on RAMS topics in their courses. However, in mathematics 49 (70%) students felt that there was not enough emphasis on RAMS topics, and in English 43 (61.4%) students gave the same response. A majority of students felt that there was enough emphasis on RAMS topics in science (47 or 67.1%) and in history or social studies (46 or 65.7%).

On the average, students were almost evenly divided as to whether there was not enough or enough emphasis of RAMS themes. Only 2.5% of those students responding indicated that there was too much emphasis of RAMS themes in their courses.

Table 8

STUDENTS' OPINIONS ON USE OF RAMS THEMES IN COURSES

How do you feel that your courses relate to the RAMS program? Mark your answers as follows:

NE -- Not enough emphasis on RAMS topics.

E -- Enough emphasis on RAMS topics.

TM -- Too much emphasis on RAMS topics.

Item Number and Description		NE	E	TM
7. Science	f	17	47	2
	%	24.3	67.1	2.9
8. Mathematics	f	49	18	1
	%	70.0	25.7	1.4
9. English	f	43	22	1
	%	61.4	31.4	1.4
10. History or social studies	f	18	46	3
	%	25.7	65.7	4.3
Average Percentages		45.3	44.4	2.5

N = 70; Differences indicate blanks.

Students were also asked to what extent they agreed with various statements relating to the project; whether they strongly agreed, agreed, disagreed, or strongly disagreed. Results on these items are shown in Table 9.

Fifty-four (77.1%) students agreed or strongly agreed that the RAMS program offers most of the school courses and activities they are interested in.

Sixty-three (90.0%) students agreed or strongly agreed that they liked learning about aerospace and marine science in other courses (such as English and history). Student response in this instance is consistent with earlier responses on the questionnaire, in which a majority of students felt that not enough emphasis was placed upon RAMS topics in English and mathematics.

Student responses to questions concerning the requirements of boating and flying by and large imply that students do grasp what is required of them in these fields. Sixty-five (92.1%) students agreed or strongly agreed that learning how to communicate clearly is important in flying and boating, and 67 (95.7%) agreed or strongly agreed that

Table 9

RAMS STUDENTS' ATTITUDES TOWARD SCHOOL AND THE PROJECT

How do you feel about each of the following things about the RAMS project? Mark your answers as follows:

SA -- Strongly agree

A -- Agree

D -- Disagree

SD -- Strongly disagree

Item		SA	A	D	SD
13. I learned a lot on the RAMS field trips.	f	26	34	3	5
	%	37.1	48.6	5.7	7.1
14. The RAMS program offers most of the school courses and activities I am interested in.	f	21	33	12	2
	%	30.0	47.1	17.1	2.9
15. I like learning about aerospace and marine science in my other courses (such as English and History).	f	22	41	5	1
	%	31.4	58.6	7.1	1.4
17. Learning how to communicate clearly is important in flying and boating.	f	35	30	2	0
	%	50.0	42.9	2.9	0.0
18. I like to learn about science and do experiments more than flying and boating.	f	34	17	8	11
	%	48.6	24.3	11.4	15.7
19. Mathematics is important in flying and boating.	f	35	32	2	1
	%	50.0	45.7	2.9	1.4
20. I like to come to school mostly when we are going on a RAMS field trip or when we are going to learn something interesting about aerospace or marine science.	f	42	20	2	4
	%	60.0	28.6	2.9	5.7
21. The RAMS teachers really take an interest in their students.	f	12	28	20	4
	%	17.1	40.0	28.6	5.7
22. I have learned a lot from the speakers who come into our school to tell us about aerospace and marine science.	f	21	36	10	1
	%	30.0	51.4	14.3	1.4

mathematics is important in flying and boating. This response suggests that the RAMS project has succeeded in an important aspect of its operations, since marine science and aerospace are generally perceived by students as a motive for increased achievement in reading and mathematics. Student response indicates that students are largely aware of the important relationship between the classroom and the world outside of the classroom.

Students generally provided positive responses for items dealing with field trips and special activities. Sixty (85.7%) students agreed or strongly agreed that they learned a lot on the RAMS field trips. Sixty-two (88.6%) students agreed or strongly agreed that they liked to come to school mostly when they were going on a field trip or when they were going to learn something interesting about aerospace or marine science. And 57 (81.4%) students agreed or strongly agreed that they learned a lot from speakers who came into the school to tell them about aerospace and marine science. These responses indicate that students were aware of the learning involved in field trips and speaker activities and found these aspects of RAMS especially motivating.

Question 24 on the Student Questionnaire asks students to rate the number of field trips they had as too many, not enough, or about the right number. Forty-three (61.4%) students responded that not enough field trips had been scheduled; 21 (30%) about the right number; and only 1 (1.4%) too many. This finding suggests that field trips and activities provide an excellent opportunity for RAMS to motivate students in their academic learning.

When students were asked what was their most important reason for coming to Randall, 60 (85.7%) responded, "I wanted to be in the RAMS program."; and 3 (4.3%) students each gave the following responses: "My family lives in this neighborhood."; "I like the Randall school better than any other school I could attend."; and "Other reason." The most important finding from this response is that RAMS students by and large chose to be in the program themselves and that location was not a factor.

Nine students liked the field trips in the RAMS program the most. Eleven students cited aspects of aerospace science: flight training (7), careers in aerospace (3), and working at the airport. Only 3 students cited as the aspect they liked most activities relating to marine science: Navy ROTC, trips to fishing and swimming. A number of students cited aspects concerning personal interaction with others involved in the program, from teachers to interesting people. Student response to this item contains a strong underlying appreciation for the importance of career development.

When asked what they liked least about the RAMS program, student response fell roughly into two categories: not enough field trips and other activities (movies, dances) (16 students), and not enough supplies, teachers and books (11 students). Two students responded that there was a lack of information on some careers, and one student responded that some classes were not related to aerospace.

Student recommendations for improvement in RAMS call for more field trips and outside activities (16), more equipment and books (9), more teachers (4), better programs (4), and more students (2). Other responses include: more funds, more English classes, a larger building, more courses, more training, a better correlation between math and science instruction, and clubs and other opportunities for students to socialize should be provided.

Responses to the student questionnaire indicate an overall positive student response to the program and its courses, although some room for improvement in the emphasis of RAMS themes was indicated. Most importantly, the relationship between school and work -- at the crux of the RAMS program's attempt to motivate students in the classroom -- seems to be appreciated by students.

The student questionnaire results tend to support that part of Objective 5 dealing with a favorable improvement in student attitudes toward school, self and the world of work, although this sampling of RAMS student opinion was not sufficiently large to allow these positive findings to be entirely conclusive.

F. RETENTION IN SCHOOL

The holding power of the RAMS program is a reflection of its inherent interest to students and its ability to motivate students to participate and continue with their schooling. The fact that RAMS draws a city-wide student body suggests that students must maintain a high level of motivation to keep up the amount of commuting that is often required.

Recognizing the importance of retention in school, the program coordinators stated the following as Objective 6:

> "Student retention in school will be increased as measured by comparison with Randall retention rates from earlier years and with citywide rates for comparable grade levels."

Attendance retes were obtained to test this objective with the comparison of this year's RAMS students with students from previous years and citywide.

The results suggest excellent progress for RAMS, with 89.0% attendance in 1976-77 and 90.0% attendance in 1977-78, an improvement over the 82.5% attendance in 1975-76.

Comparisons to system-wide results are not fully conclusive, since system-wide data for 1977-78 were not yet available. However, attendanoe was better in RAMS in the two previous years (1975-76, 87.5%; 1976-77, 89.0%) than it was system-wide for senior high schools (1975-76, 79.5%; 1976-77, 77.2%).

In general, these results support the objective of improving school retention.

Further evidence for retention in school was obtained from the students themselves. Fully 31.4% indicated that they had thought about dropping out of school (Question 26, Student Questionnaire). About 80% of this group indicated that their interest in RAMS was one of their reasons for staying in school. When both the attendance records and the students' own statements are weighed, the objective of retaining students appears clearly to have been achieved.

Table 10 shows the attendance rates for students in the program and in senior high schools system-wide for the past three years.

Table 10

COMPARISON OF ATTENDANCE RATES (MEDIANS)

BY YEAR OF THE PROGRAM

	1975-76	1976-77	1977-78
RAMS	82.5	89.0	90.0
System-wide Senior High Schools	79.5	77.2	Unavailable
Difference	3.0	11.8	----

CHAPTER 4

COMMENDATIONS AND RECOMMENDATIONS

In view of the excellent progress of the RAMS program, it is appropriate to commend those who have materially contributed to its success. Commendations are in order to the following:

1.) The program coordinators, who have done an admirable job in the face of many difficulties and obstacles. These individuals deserve commendation for their efforts in formulating and designing the RAMS concept in such a way as to accommodate the educational situation in Washington, D.C.; for their efforts in mobilizing the unique resources in the Washington, D.C. area; for their accomplishments in curriculum development; for their ability to relate to students and make the RAMS program meaningful to them. It is through their efforts that RAMS has become a true educational alternative in Washington, D.C.

2.) The school system administration -- the support provided by the school system administration, its continuation of the program, and its decision to convert RAMS to a career education center deserves special commendation.

3.) Teaching staff -- Commendations go to those members of the teaching staff who have effectively used RAMS themes and correlated classroom and field work to the students' benefit.

4.) Community resources -- the many organizations, agencies, and individuals who have given their time, materials, facilities and interest are commended.

5.) The students are commended for their unflagging interest and support; for demonstrating through their improved achievement that they are capable of learning when given opportunities of interest to them.

The recommendations that follow, when implemented, should improve the program even further:

1.) The RAMS program should be continued and expanded. Emphasis would be continued on drawing interested students from throughout the city. The RAMS program has demonstrated that it can accommodate 300 students effectively, and there seem to be many more students interested. The renewed support and leadership of the school administration will be particularly important as RAMS makes the transition to a career education

center. Furthermore, the program coordinators will need the proper authority and support to handle the myriad details of program and staffing if RAMS is to meet its full potential.

2.) The staff of the RAMS Career Education Center should be carefully selected to include teachers supportive of the program's aims and capable of teaching RAMS themes and high school level subjects. The teaching staff is critical to effective implementation of the program. Although a nucleus of from perhaps five to eight teachers is now available, new, fully capable and committed staff members are needed to accommodate the 500 students projected for 1978-79 and in future years.

3.) Staff development, both preservice and inservice, should be fully supported so that teachers can be properly trained in the RAMS approach. In its three years of operation, insufficient staff development support has been a notable deficiency of the program.

4.) Curriculum development should be continued and expanded. Although noteworthy accomplishments have been made by the program coordinators, much more needs to be accomplished. There should be major efforts in both the aerospace and marine science areas that will consolidate available materials into a Competency Based Curriculum and one that is suitable for career development and exploration. To do this effectively may require funds for outside consultants and teacher released time.

5.) The RAMS program's career development focus should be more sharply defined in terms of program strategies, goals and objectives, in keeping with its new role as a career education center.

6.) A suitable permanent facility should be found to house the RAMS program. If the Randall facility is closed, as presently planned, a facility should be found that is convenient for travel from all sections of the city, with programs that would complement RAMS and with a supportive administration.

7.) Goals and objectives for the program should be reformulated and the program should be reevaluated in its new role. In view of RAMS' new role, it would be appropriate to assess its continuing progress. Goals and objectives, stated in measurable terms, should include the areas of system-wide opportunities, program operations, administrative support, staffing, staff development, resource development and utilization, student achievement, career development, and retention in school. In this way a comprehensive evaluation can be carried out to point out new directions for RAMS and make continuous improvements.